



# Education of Data Science in Keio SFC High School



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Keio Shonan Fujisawa  
Senior and Junior High School



KEIO 150  
Design the Future



1. Introduction to Keio SFC High School
2. Education of Data Science in Keio SFC High School
3. Present Condition of Statistics Education in Japan

# My Background



1992 BSc

1994 MSc

1994~

- Math teacher in Keio SFC High School
- Lecturer in Keio University (SFC Campus)

2000~ Doctoral Student in Shibata Laboratory

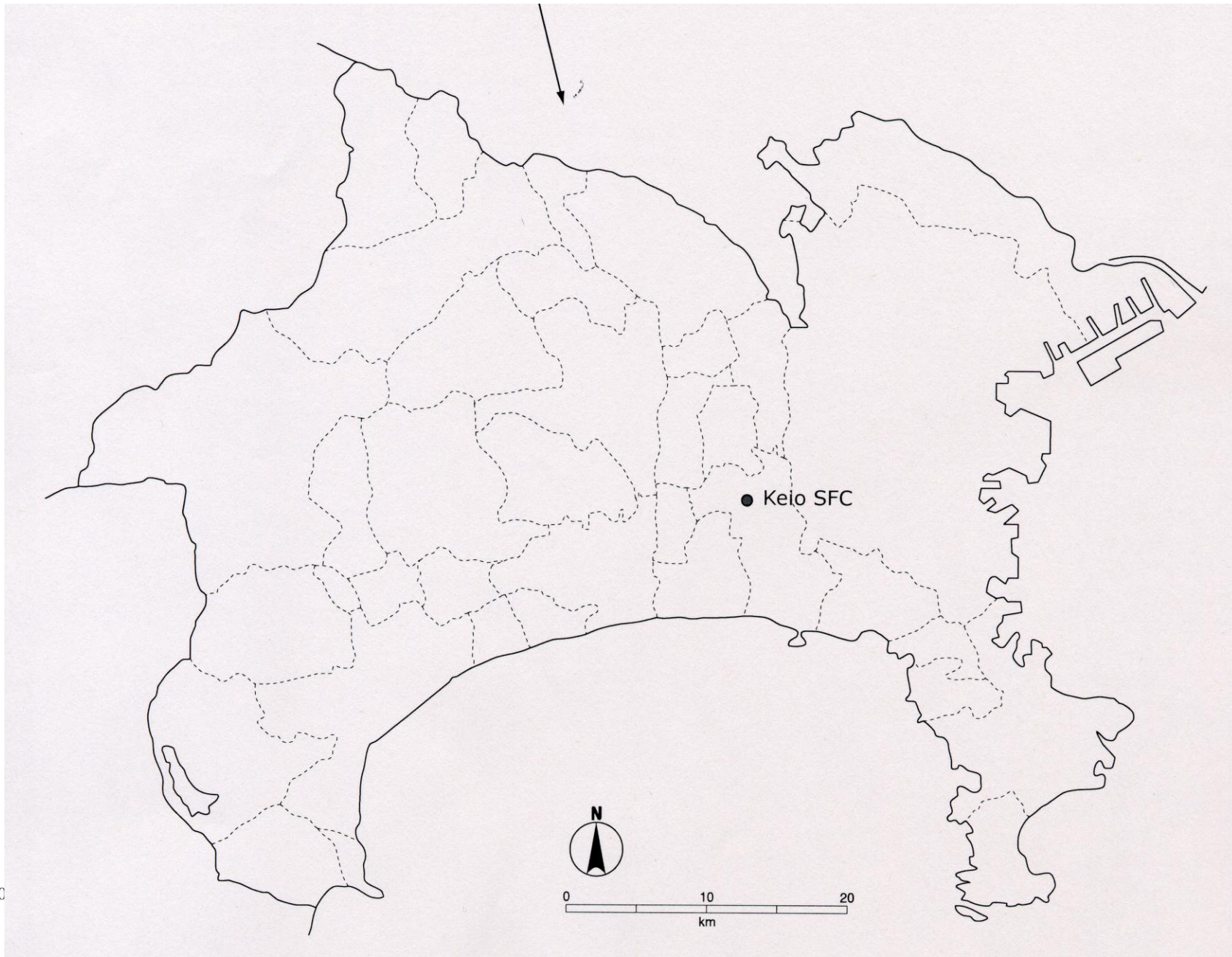
2005 PhD



- Located in Fujisawa, Kanagawa
- Opened in 1990
- 3 Faculties, 1 Graduate School, 1 High School



# Keio SFC



# Keio Schools



Elementary Education

Keio Yochisha Elementary School

Secondary Education

Keio Chutobu Junior High School

Keio Futsubu School  
[ Boys Junior High School ]

Keio Shonan Fujisawa Junior and Senior High School

Keio Academy of New York [High School]

Keio Shiki Boys Senior High School

Keio Senior High School

Keio Girls Senior High School

Keio University  
(Undergraduate and Graduate Programs)



- Opened in 1992 (Newest of affiliated Keio schools)
- Coeducational, 6-year secondary school
- 1200 students (480 Juniors, 720 Seniors)
- 300 returnees
- Most graduates go on to Keio University



# Keio SFC High School



# Keio SFC High School



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慶應義塾湘南藤沢中等部・高等部の風景



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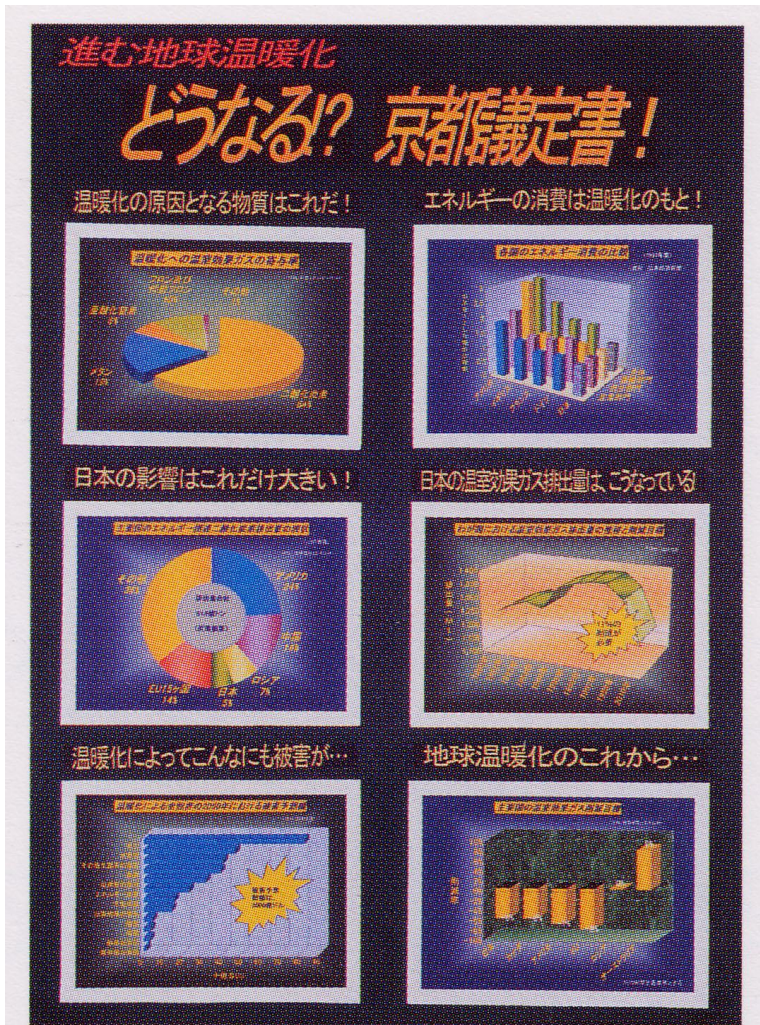
- ① Entering the Contest of Graphic Statistics  
(compulsory/optional)
- ② Elementary Study of Statistics (compulsory)
- ③ Data Science Project that use the R language  
(optional)

# ① The Contest of Graphic Statistics

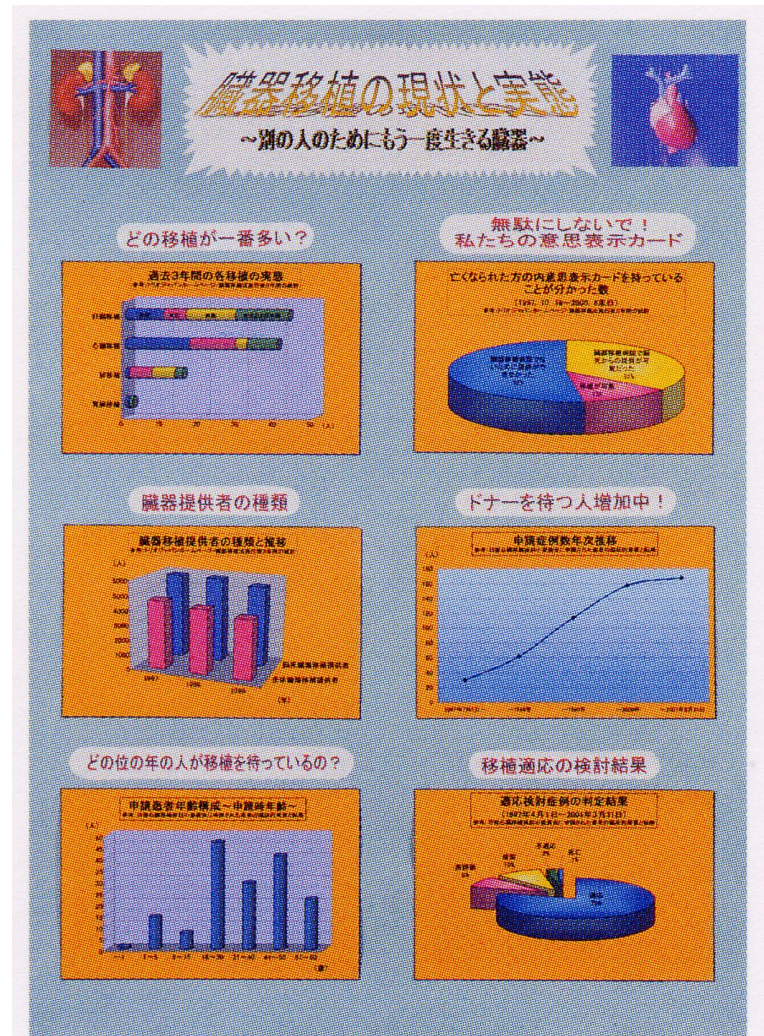


- Organized by “The National Federation of Statistical Associations” (non-profit institution) under the auspices of the government.
- 26,000 entries in 2007

# The Prize Winners



パソコンの部 知事賞  
 慶應義塾湘南藤沢中 2年 岡田 彩



パソコン部 県議会議長賞  
 慶應義塾湘南藤沢中 3年 布施香織

# ① Studies for the Contest at SFC



Entering the contest is compulsory for Jr  
optional for Sr

The social studies' teachers mainly guide students.



The students can handle various data in early ages,  
and develop their abilities to represent the data  
by the graphs concisely.

# ② Elementary Statistics in SFC (1)



Our purpose: To develop their statistical points of view

Compulsory Studies in Math

Jr-2<sup>nd</sup> (14yrs)

tree diagram, permutation, combination,  
basic properties of probability

Sr-1<sup>st</sup> (16yrs)

sets, various permutations, binomial theorem,  
event, trial



## ② Elementary Statistics in SFC (2)



Sr-2<sup>nd</sup> (17yrs)

independent events, conditional probability,  
Baye's theorem, frequency table, histogram, mean,  
variance, covariance, correlation

Sr-3<sup>rd</sup> (18yrs)

random variable, prob. distribution, expectation,  
standardization, binomial distribution, normal  
distribution, population, sample, estimation, test,  
central limit theorem

## ② Elementary Statistics in SFC (3)



Our purpose (again)

To develop their statistical points of view

Example: by using the stochastic models, we can represent various phenomena, and make good use of inferences or prediction.

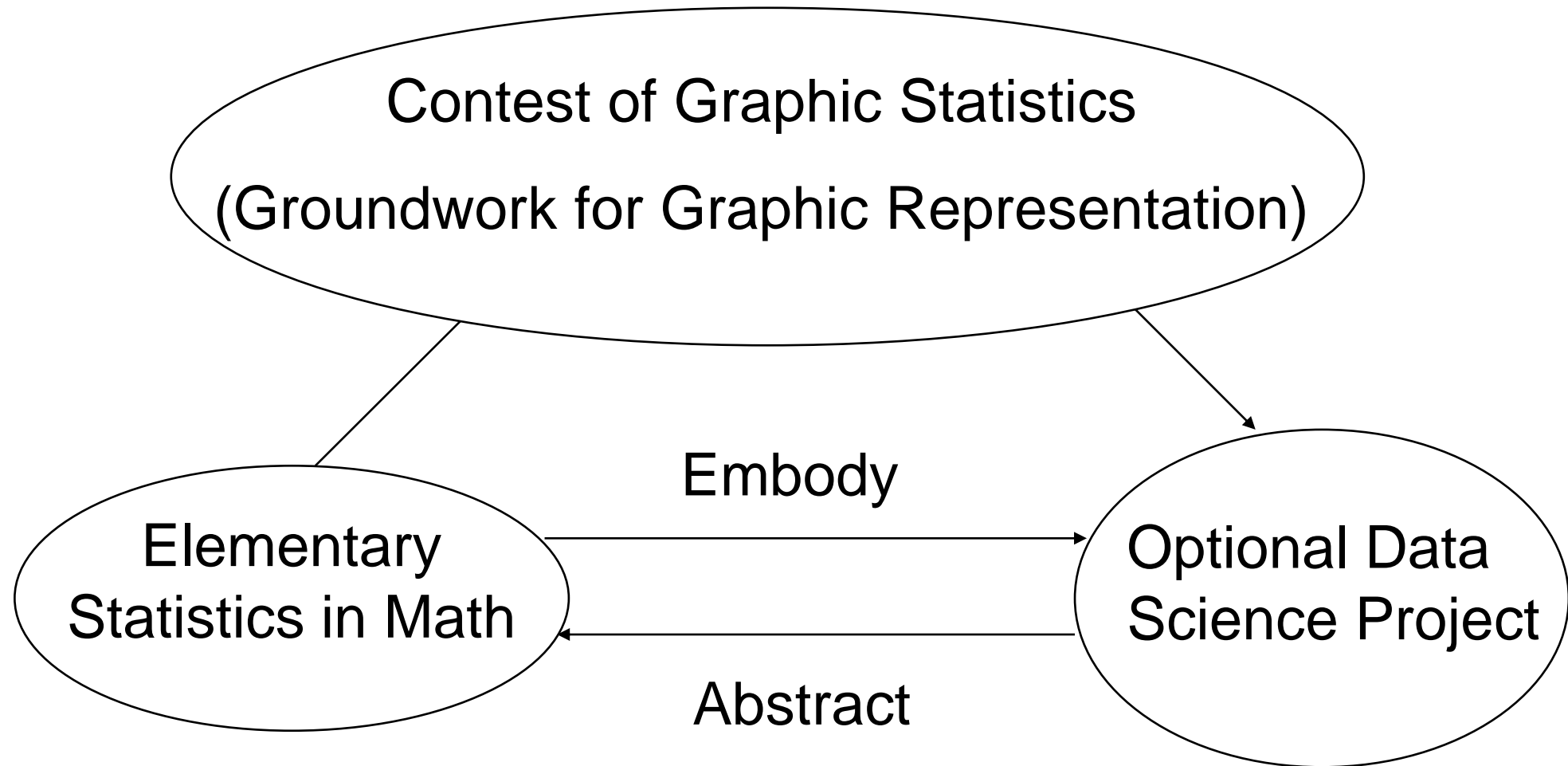
# ③ Optional Data Science Project



- For Sr 3<sup>rd</sup> (18yrs) years students
- 100 minutes per week, 6 months
- 10 ~ 20/240 students choose this project
- Students use R language

grammar of R language, graphical representation,  
topics of multivariate analysis (linear regression,  
principal component, variance analyses)

# Education of Data Science in SFC





1. Introduction to Keio SFC High School
2. Education of Data Science in Keio SFC High School
- 3. Present Condition of Statistics Education in Japan**

# Japanese Education System



- The government decides the course of study (guideline) and the textbooks for elementary and high schools.
- Most students need overcoming intense competition to pass the entrance examination to universities.

→ **Keio is free from them.**

# Statistics Education in High Schools



Although the government optionally offers several statistics projects in math, **most students do not study them.**



## Reasons

i) Statistics is rarely a required subject for university entrance exams.

# Reasons (2)



- ii) Many teachers of high schools and universities think that it is enough (or better) to start studying statistics in universities.
  
- iii) There are few teachers who can teach statistics (or data science) in high schools.



# Possible Solutions



- Teach statistics spirally.  
→ Use “Sougou-Gakushu” time to develop the students’ “ability to live a better life”
- Educate more teachers to teach data science in high schools  
→ Keio SFC math teachers understand the importance of statistics education, and 1/3 has majored in statistics.
- Have more university faculties to hold data science as a compulsory subject.